ACES

Purpose:

Develop and provide a national resource for conducting high-fidelity, system-level assessments of new air transportation operational concepts.

Modeling Environment:

The environment is designed for:

- Expansion, to provide levels of complexity not realizable with current simulators
- "Plug and play" models, as well as different levels of fidelity to be incorporated into a simulation, to allow for easy reconfiguration of the simulation to meet specific research requirements
- Easy integration of new, improved models to build the "model toolbox" capability, thus providing incentive for research community investment into the system.

Schedule:

- Build 3 (Sep 2004) is in final acceptance testing at NASA.
- Build 4 (Sep 2005) will be developed with increased usability, new models, and enhanced model fidelity.

More Information:

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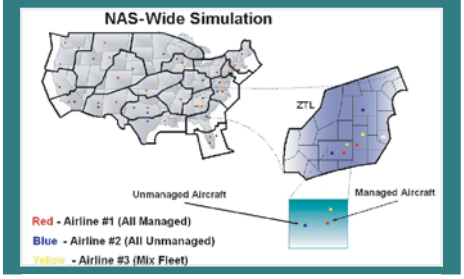

Airspace Concept Evaluation System

Overview

The Airspace Concepts Evalutation System (ACES) is a modeling and simulation environment for the air transportation system that is being developed at the NASA Ames Research Center and which is being supported by NASA's Airspace Systems Program. The ACES capability captures the key feedback response mechanisms of the National Airspace System (NAS). The agent-based modeling approach that is being used represents the individual behaviors of the airspace participants and captures the critical ripple effect of one user's actions on other system participants. This modeling approach isolates the individual models so they can continue to be enhanced, improved, and modified to represent new concepts with low development impact on the overall simulation system. ACES Build 3 is now operational within the Virtual Airspace Modeling and Simulation Lab at NASA Ames. Future software releases will enhance the modeling toolbox by adding new NAS component models, by increasing model fidelity, and by insuring usability for airspace analysts.

Accomplishments

- ACES was used to perform a high level system-wide assessment of selected future NAS concepts. A presentation of the results was prepared for the Associate Administrator of NASA's Office of Aerospace Technology, which demonstrated the significance of delays for future traffic demands and that assessed concepts may substantially reduce these delays.

- ACES is being used to evaluate a future air traffic control system referred to as the Advanced Airspace Concept (AAC) developed at NASA Ames. AAC increases system capacity by reducing air traffic controller workload associated with tactical separation assurance. ACES has successfully simulated the Conflict Prediction and Resolution System, a key element of the AAC

- An ACES sensitivity analysis was performed to study the effects on delay as demand increases with time and as capacity decreases with inclement weather. The results were presented at the AIAA ATIO conference in September 2004. As demand was increased, the results showed a quadratic increase in delay. Delay was shown to increase linearly with decreasing NAS wide capacity.

- A detailed validation of Build 3 simulation performance began. Simulation results were compared flight by flight with real world Out-Off-On-In data. Results show an extremely high actual time en-route correlation of .99 between the simulation and the real world. The average actual block time difference between the simulation and the real world is less than a minute.

- Basic en-route controller tasks have been represented in ACES using Apex, a Lisp based framework for simulating human cognitive behavior.

- ACES is currently being used by the U.S. Air Transportation Joint Planning and Development Office (JPDO) established by the Secretary of Transportation. The JPDO uses ACES to evaluate the magnitude and types of problems that may arise if the air transportation system is not expanded to meet future demands and to evaluate specific strategies for transforming the NAS.